NEW FASANT

MATERIALS USER GUIDE

Version 5.7.30.07.2013

Index

1. *Materials* menu

In this section all the features available in the *Materials* menu are explained. All the operations shown in this section have been performed using *POGCROS*, and the rest of the modules include the same options unless stated otherwise. The available options in the *Materials* menu are shown in Figure 1.

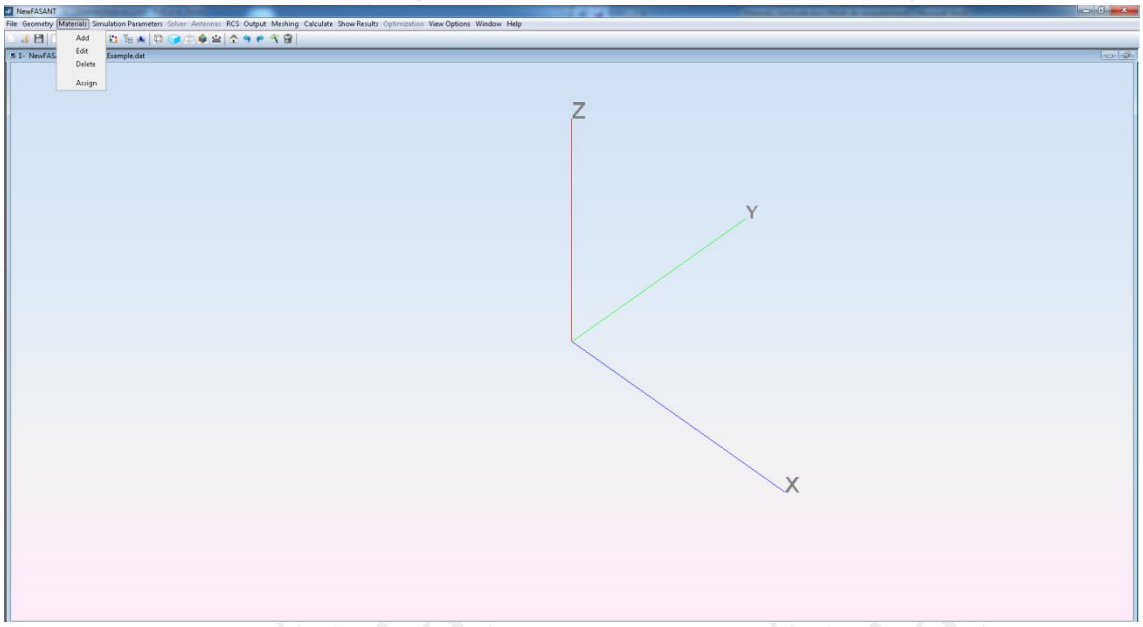

Figure 1: Materials menu.

In the following sections all the options of the *Materials Menu* are detailed.

1. Add

When *Add* is selected, the *Add Material* window appears, as shown in Figure 2.

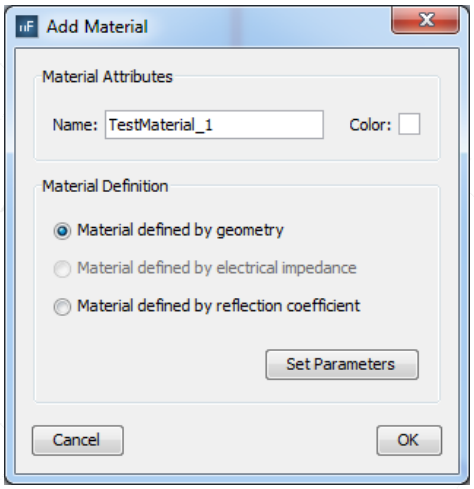

Figure 2: Add Material window.

In the *Add Material* window, the following options are available:

- Material Attributes - Name. The user will specify the desired name for the new material.
- Material Atributtes - Color. The user will assign here different colours to the new materials defined. When the *Color* box is selected, the *Choose Material Color* window appears, and three different options are available to select a color. Press *Ok* to confirm changes, *Cancel* to exit without saving the color configuration, or *Reset* to assign the default color.

  - Choose Material Color – Swatches (Figure 3).

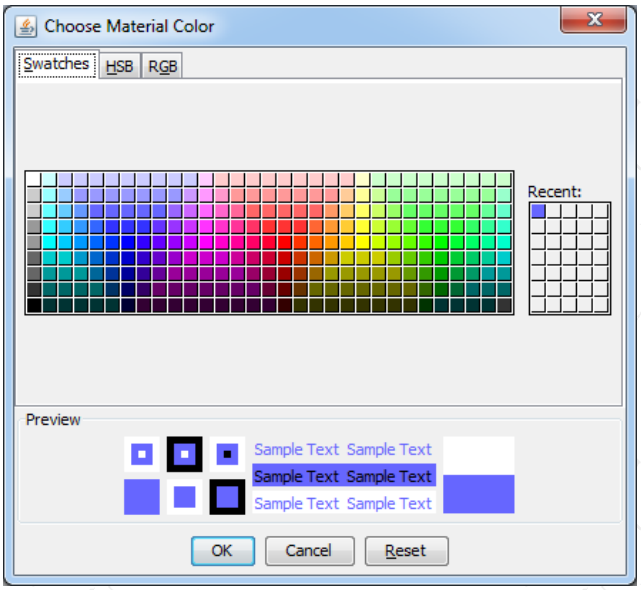

Figure 3: Choose Material Color - Swatches window.

  - Choose Material Color – HSB (Figure 4).

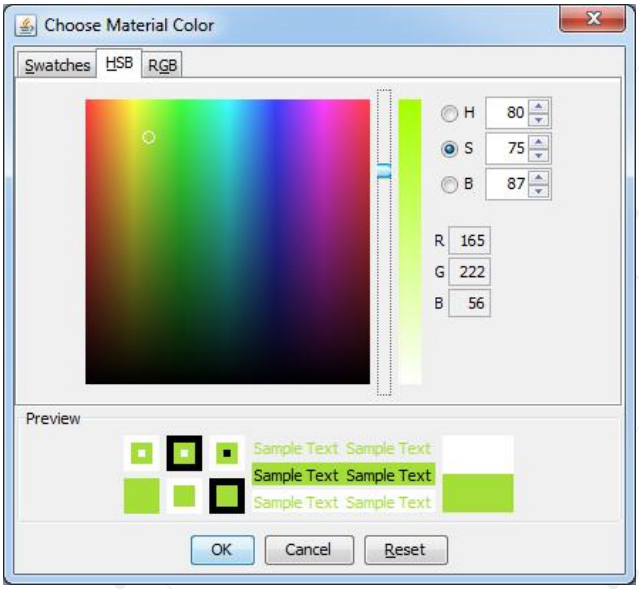

Figure 4: Choose Material Color – HSB window.

- **Choose Material Color – RGB** (Figure 5).

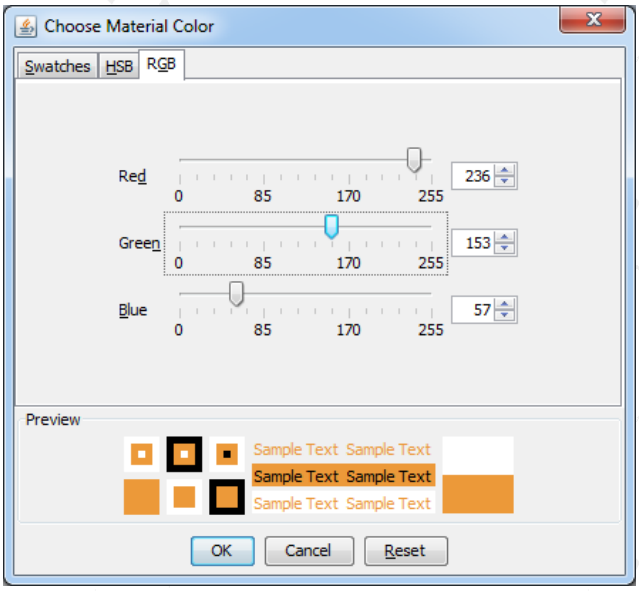

Figure 5: Choose Material Color - RGB window.

- **Material Definition - Material defined by geometry**. Used to define a material according to its physical properties. After clicking on the *Set Parameters* button, two different options are available in the *Material defined by Geometry* window (Figure 6):

  - **Constant.** To set the material properties invariable. *Epsilon* and *Mu* are defined with the same restrictions.

    - **Real part:** common values are greater than or equal to 1.0.

- **Imaginary part:** if the imaginary part is negative, the material is considered to have losses; otherwise it would be equivalent to a material with gain.

- **Variable with frequency.** To set the physical properties of the material according to the frequency.
  - **Frequency (in GHz):** Sets the associated frequency to the physical properties. The frequency values for each material are interpolated when the simulation is launched in order to use the most suitable one for the working frequency.
  - **Real part (’):** common values are greater than or equal to 1.0.
  - **Imaginary part (’’):** if the imaginary part is negative, the material is considered to have losses; otherwise it would be equivalent to a material with gain.
  - **Add:** to add new frequencies to the material properties.
  - **Remove:** to remove existing frequencies to the material properties.

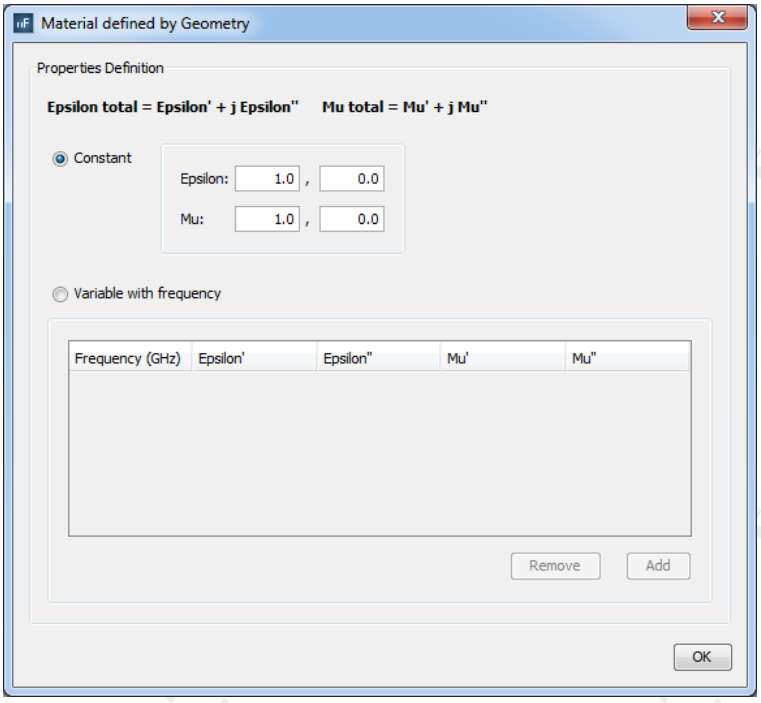

Figure 6: Material defined by Geometry window.

- **Material Definition - Material defined by electrical impedance.** To define a material according to its electrical impedance. This option is not available at the moment.
- **Material Definition - Material defined by reflection coefficient.** To define a material according to its reflection coefficient. This option is only available in the POGCROS module. When clicking on the *Set Parameters* button, two

different options are available in the *Material defined by Coefficient* window (Figure 7):

- **Constant.** To set the material properties invariable. *Vertical Polarization* and *Horizontal Polarization* are defined with the same restrictions.
- **Amplitude (dB):** positive and negative values may be introduced.
- **Phase (deg):** positive and negative values may be introduced.

- **Variable with frequency.** To set the material reflection coefficient properties according to the frequency.
  - **Frequency (in GHz):** Sets the associated frequency to the physical properties. The frequency values for each material are interpolated when the simulation is launched in order to use the most suitable one for the working frequency.
  - **Amplitude (dB):** positive and negative values may be introduced.
  - **Phase (deg):** positive and negative values may be introduced.
  - **Add:** to add new frequencies to the material properties.
  - **Remove:** to remove existing frequencies to the material properties.

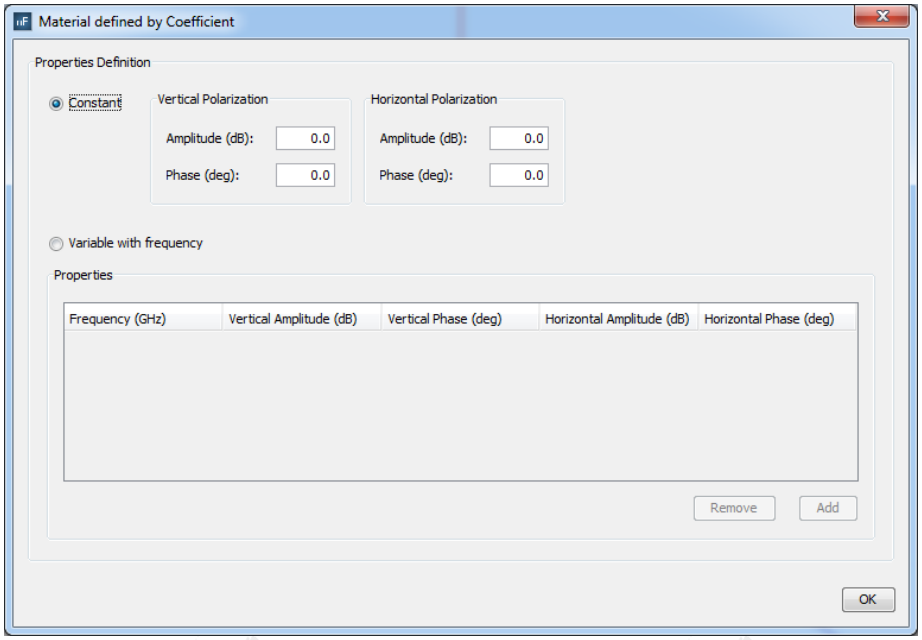

Figure 7: Material defined by Coefficient window.

2. Edit

This option allows the user to modify an already defined Material. When the *Materials – Edit* option is selected the *Edit Material* window (Figure 8) appears. When the material to be edited has been selected in the *Select material* combo box, its colour can be modified. It is important to highlight that the properties of the materials may be modified, but not their type (*defined by geometry*, *defined by electrical impedance*, or *defined by reflection coefficient*). To edit the material parameters, click on the *Ok* button and the corresponding

type window (Figure 6 or Figure 7) is opened. The rest of the editing process may continue as explained in section "1. Add".

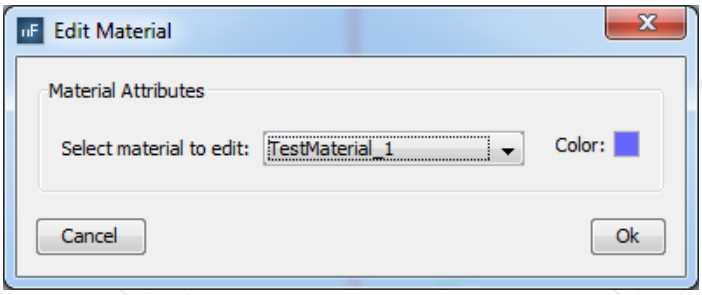

Figure 8: Edit Material window.

3. Delete

This option allows the user to remove an already defined Material. When the *Materials – Delete* option is selected, the *Edit Material* window (Figure 9) appears. When the material to be deleted has been selected in the *Select material* combo box to be deleted, the action can be confirmed by clicking on *Ok*.

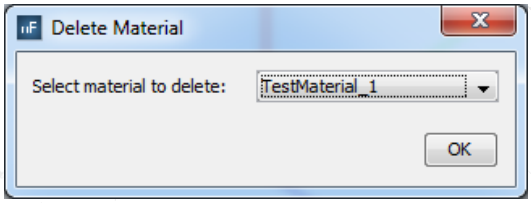

Figure 9: Delete Material window.

4. Assign

The geometry properties referred to materials can be edited by clicking on *Materials – Assign*. After selecting this option, the surfaces/objects whose materials are to be associated must be selected, and confirm the selection with the "Assign Selection" button, as shown in Figure 10.

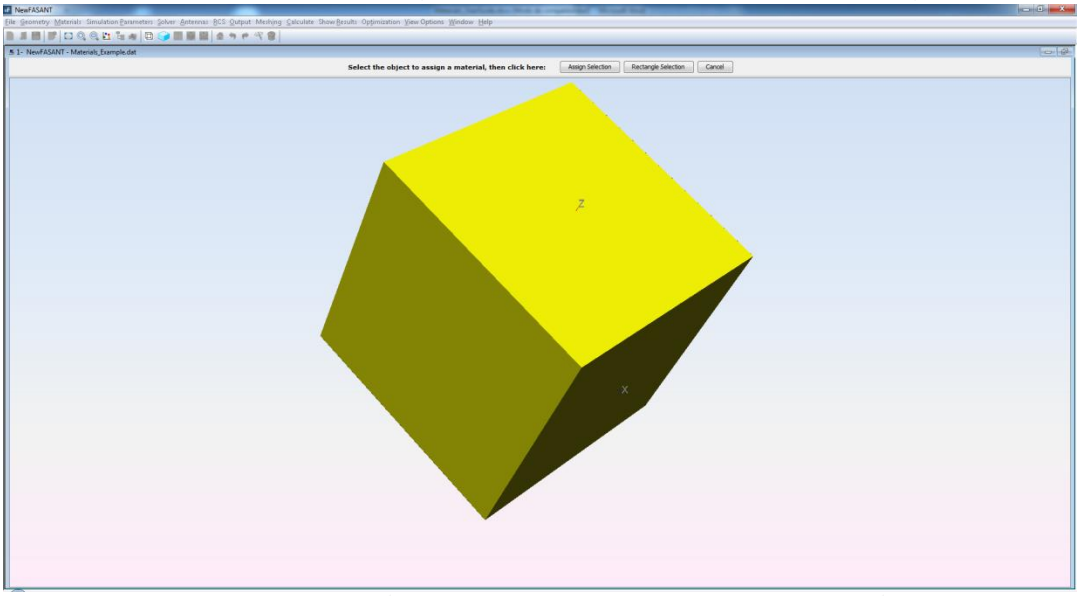

Figure 10: Material assignment to surfaces process.

When the surfaces selection has been confirmed, the *Assign Material* window represented in Figure 11 will appear in order to set the material configuration associated to the surfaces selected. All the surfaces that compose the objects can have different material properties listed in the field *Object Surface – Material* of the window.

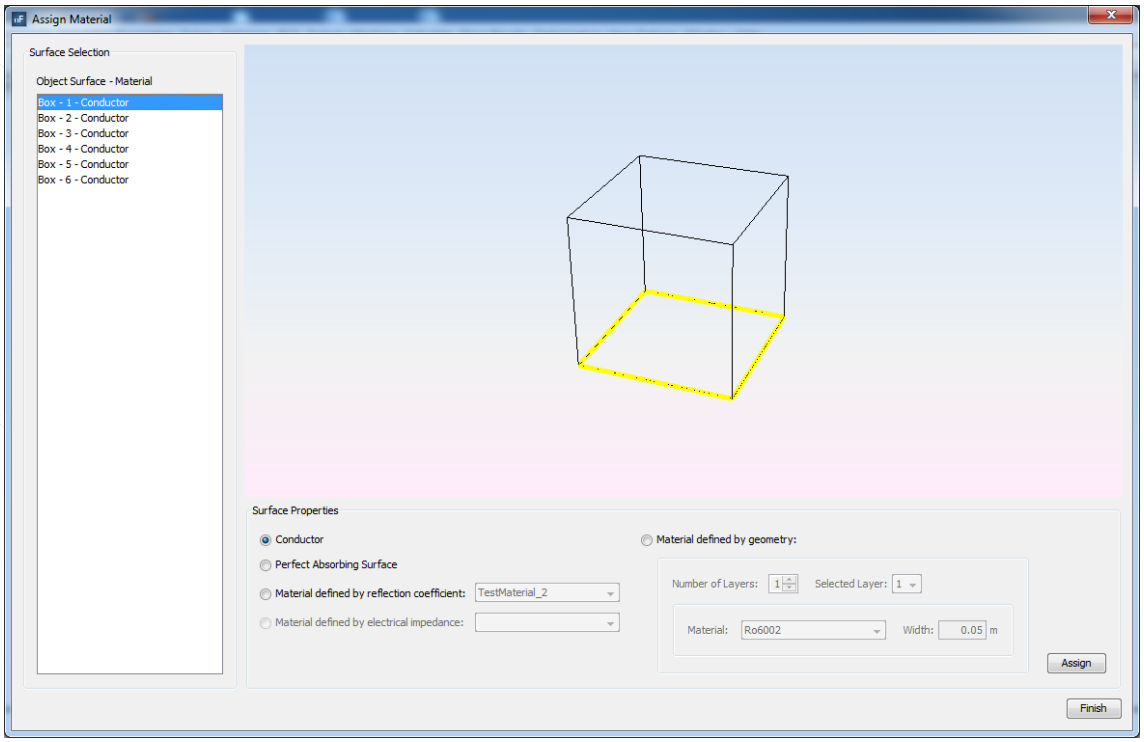

Figure 11: Assign Material window.

The following options can be applied to surfaces:

- **Conductor.** The objects of this type of material are metallic, or PEC (Perfect Electrical Conductor). This is the material selected by default.
- **Perfect Absorbing Surface.** The objects of this type of material are perfectly absorbing. This type is only available in the GTD or PO modules.
- **Material defined by reflection coefficient.** If there are materials defined with this type, it is possible to assign them by selecting from the combo box.
- **Material defined by electrical impedance.** If there are materials defined with this type, it is possible to assign them by selecting from the combo box. This option is not available at the moment.
- **Material defined by geometry.** For this kind of material it is possible to define several layers with a different material for each one, with the restriction of being all of them of the type *Material defined by Geometry*:

  - **Number of Layers:** to specify the number of layers to be considered in this object.
  - **Selected Layer:** to select the layer that is being edited.
  - **Material:** available from the combo box list, assigned to the layer.
  - **Width:** to assign thickness to each layer.

  When the object to assign the material has been defined as a *Volume*, only the field *Material* can be edited.

- **Assign** button. To confirm the changes.
- **Finish** button. To exit by saving changes.

2. *Materials* menu *(IR* module*)*

The *IR* module includes a database of materials that can be modified by the user. The user can add, edit and delete materials from the database. These materials can be assigned to different parts of the geometry. This assignment is performed via the *Material* and *Uptake* menu.

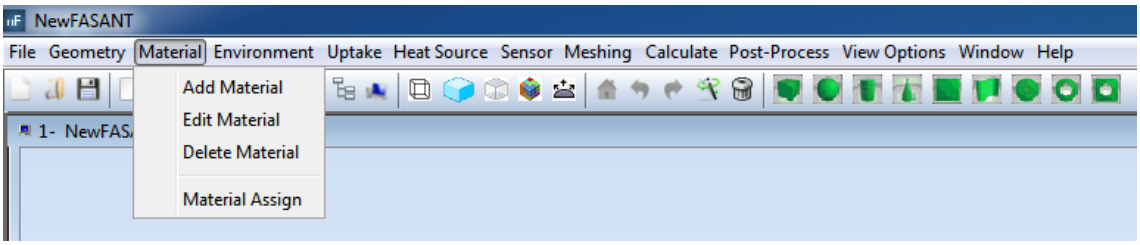

Figure 12: Material Menu

1. Add Material

This option allows the user to add a new material. A number of parameters have to be introduced in order to define a new material. It is possible to assign a color to a given material by clicking on the color square.

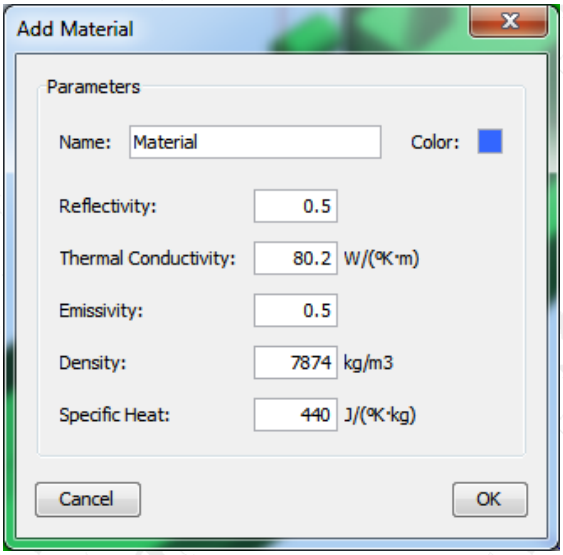

Figure 13: Add Material window.

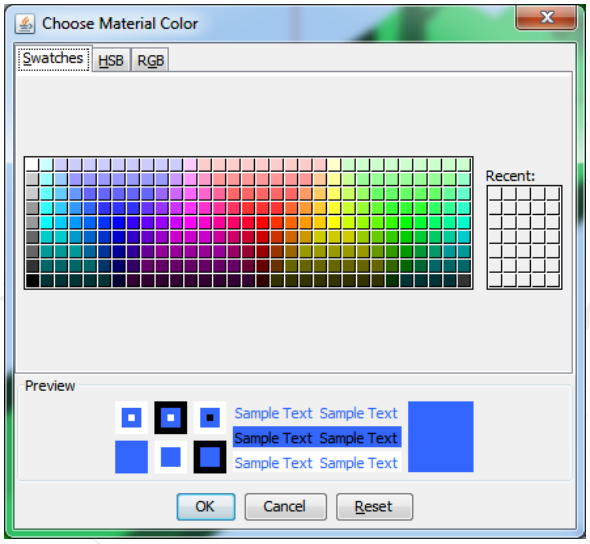

Figure 14: Material color selector window.

2. Edit Material

This option allows the user to edit an existing material.

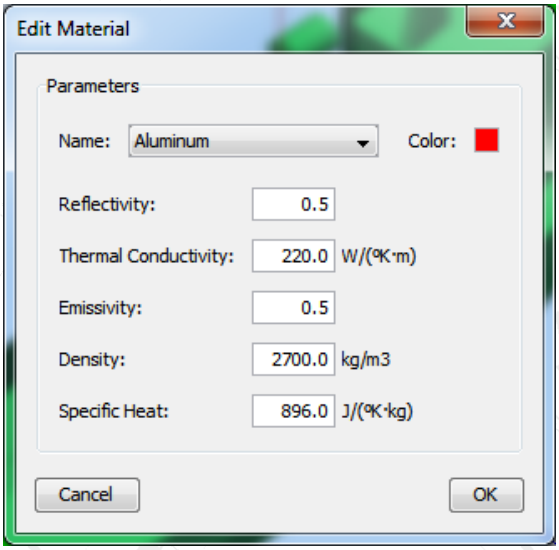

Figure 15: Edit Material box window.

3. Delete Material

This option allows the user to delete an existing material.

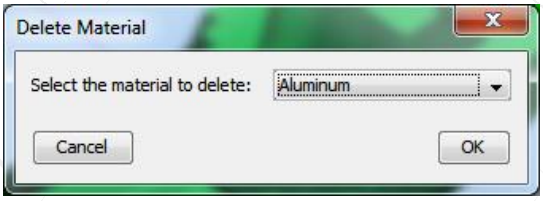

Figure 16: Delete Material window.

4. Material Assign

This option allows the user to assign an existing material to an element of the structure, previously selected with the selector.

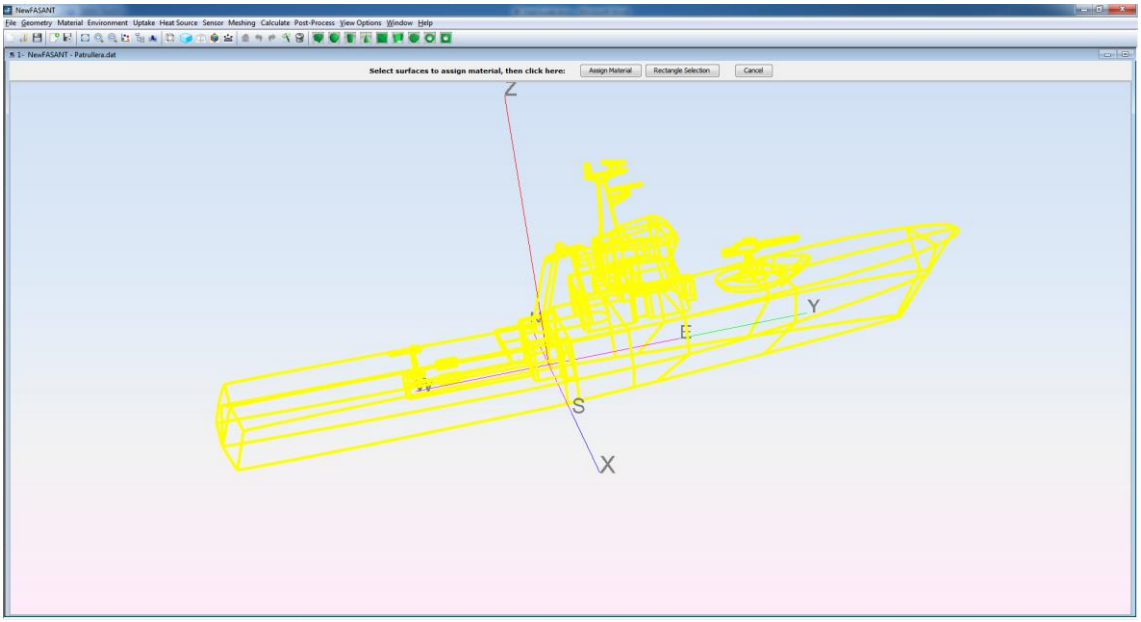

Figure 17: Surface selection before material assignment.

The assignment of materials includes the possibility of adding a number of layers (at least one), each of them associated to its own material and thickness.

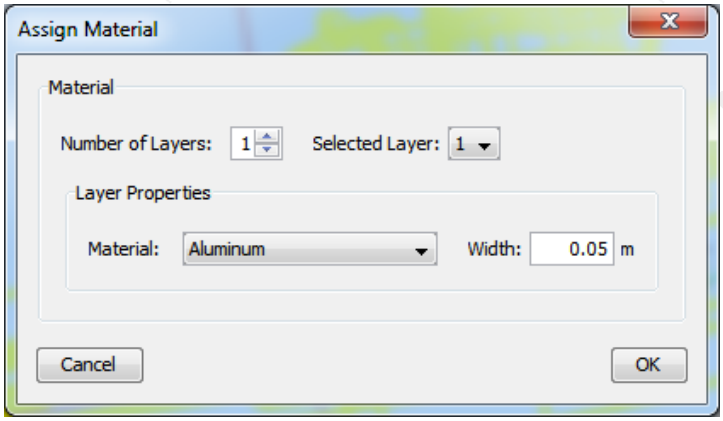

Figure 18: Material Assign window.

3. Materials menu *(Periodical Structures* module*)*

All the information concerning the material configuration in the *Periodical Structures* module is included in the *Cell* menu. To learn more about this, please read section "*1. CELL*" (section *"1. Define Layers"*) of the *Periodical Structures Module* user guide.

4. *Materials* menu *(Radome* module*)*

All the information concerning the material configuration in the *Radome* module is included in the interface definition process. To learn more about this, please read section "*4. RADOME MENU*" (section *"3. Assigning materials to the layers"*) of the *Radome Module* user guide.

5. *Materials* menu *(Reflectarrays* module*)*

All the information concerning the material configuration in the *Reflectarrays* module is included in the cell definition process. To learn more about this, please read section "*1. REFLECTARRAYS OVERVIEW*" (section *"2. Cell Menu"*) of the *Reflectarrays Module* user guide.

6. *Materials* menu *(Circuit Analysis - Microstrip* module*)*

The existing options available in the *Materials* menu of the *Circuit Analysis – Microstrip* module are the same ones than explained in section 1. The only new feature is the *Materials - Calculate Line Width* option, which is a tool for calculating the ideal width of a line. When this option is selected the user needs to select the substrate and set the desired impedance and the frequency. After pressing *Calculate*, the computed width is displayed.

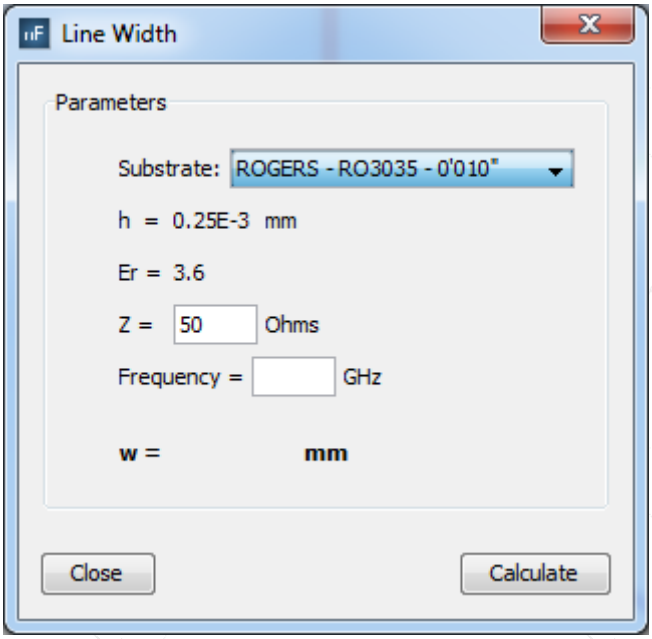

Figure 19: Line Width window.

7. Appendix 1: List of figures